

RRS MODIFICATION NOTE 01 (for Electronics Technicians)
Maintenance, Logistics, and Acquisition Division
W/OPS12: KC

SUBJECT : Radiosonde Replacement System GPS Repeater System Initial Installation

PURPOSE : To provide GPS satellite signals into the Upper Air Radiosonde Office Preparation Area for purposes of Radiosonde baselining

EQUIPMENT AFFECTED : All sites scheduled for RRS systems in the CONUS, Alaskan, and Pacific regions. See Attachment B.

PARTS REQUIRED : The following parts should be ordered through the National Logistics Support Center (NLSC):

EQUIPMENT	ASN	MANUFACTURER
GPS Repeater System Kit	J700-2A4	NWS

SPECIAL TOOLS REQUIRED : None

MODIFICATION PROCUREMENT : None

EFFECTIVITY : Concurrent with initial installation of RRS Workstation System.

ESTIMATED TIME REQUIRED : Approximately 8 Hours

EFFECT ON OTHER INSTRUCTIONS : None

AUTHORIZATION : Site Facility Manager

VERIFICATION STATEMENT : This modification note was tested the Sterling Research and Development Center, Sterling, VA. and at the NWS Training Center (NWSTC) in Kansas City, MO.

TABLE OF CONTENTS

GENERAL	1
PROCEDURE	1
1. GPS REPEATER SYSTEM COMPONENTS	1
2. INSTALLATION OF THE TRIPOD ANTENNA MOUNT (J700-2A4MP1)	3
3. INSTALLATION OF THE RECONFIGURABLE ANTENNA MOUNTING BRACKET (J700-2A4MP2)	6
4. INSTALLATION OF THE GPS RECEIVE ANTENNA (J700-2A4A1) TO THE ANTENNA CONDUIT (MAST)	8
5. ATTACHING THE ANTENNA MAST TO THE TRIPOD OR RECONFIGURABLE ANTENNA MOUNTING BRACKET	10
5.1 Tripod Mount.	10
5.2 Reconfigurable Antenna Mounting Bracket.	10
6. INSTALLING THE GPS ANTENNA LIGHTNING ARRESTOR (J700-2A4A2) AND GPS ANTENNA GROUNDING KIT (J700-2A4A2A1)	11
7. ROUTING THE GPS ANTENNA/REPEATER AMPLIFIER CABLE (J700-2A4W2) ...	12
8. MOUNTING THE GPS REPEATER/AMPLIFIER (J700-2A4A4) AND THE GPS RE- RADIATING ANTENNA ASSEMBLY (J700-2A4A3)	14
9. CALIBRATION OF THE GPS REPEATER AMPLIFIER	18
REPORTING INSTRUCTIONS:	23
ATTACHMENT A - EMRS REPORT SAMPLE	A-1
ATTACHMENT B - RRS SITES	B-1

GENERAL**Radiosonde Replacement System (RRS) GPS Repeater System Installation Instructions**

This procedure defines the installation of the GPS Repeater System at NWS owned and leased facilities. These instructions are intended to be carried out by two Electronic Technicians with the assistance of a Facilities Engineer or staff member familiar with the structure of the building's roof and exterior wall materials. An externally mounted GPS antenna will be required for this installation. The GPS antenna, when properly mounted, must have an unobstructed view of the sky. Ideally, the GPS antenna base shall serve as the reference plane for viewing the GPS Satellite constellation. Depending on the roof structure of the building, a tripod antenna stand to accommodate flat roofs or an side mount/under eave reconfigurable antenna mount, can be used for the external GPS antenna. Lightning protection is also required for this antenna. A surge arrester is provided with the GPS Repeater System that is installed in close proximity of the antenna bracket and the GPS antenna cable entry point into the building. This surge arrester will require a connection to earth ground, external to the building.

NOTE: Installations at leased facilities must be coordinated with the owner or landlord in order to obtain permission to penetrate either the roof surface or exterior wall at or near the top of or along the roof line for mounting the external reconfigurable mounting bracket and for providing an entry point for the GPS Antenna/Repeater Cable into the building.

PROCEDURE**1. GPS REPEATER SYSTEM COMPONENTS**

The following sub-assemblies make up the GPS Repeater System in kit form (ASN: J700-2A4). This kit should be ordered well enough in advance of other Radiosonde Replacement System components to allow for installation and checkout:

GPS Repeater System J700-2A4	
COMPONENT	ASN / DESCRIPTION
GPS Receive Antenna	J700 - 2A4A1 (Alternate ASN: J700 - 1A4A1)
GPS Antenna Mounting Bracket	J700 - 2A4MP1 (Tripod) consisting of the following: One three-foot tripod stand with center anchor bolts and hex nuts, 6 lag screws, three roof waterproofing patches, 2-four foot sections of one-inch conduit, coupler, and one threaded coupler.
GPS Antenna Mounting Bracket	J700 - 2A4MP2 (Bracket) consisting of the following: Three piece, pre-drilled, angled stainless steel plates; a Ziploc bag containing: 2 1/4-20 threaded U-bolts with 2 backing plates, 12 - 1/4-20 hex cap bolts- 1-1/4 in length, and 16 1/4-20 Nyloc locking nuts.
GPS Antenna Lightning Arrestor	J700 - 2A4A2

GPS Repeater System J700-2A4	
COMPONENT	ASN / DESCRIPTION
GPS Antenna Grounding Kit	J700 - 2A4A2A1 consisting of the following: 100 feet of 06 gage copper wire, ground clamp, one roll of 3M™ Type 33 electrical tape, one roll of coaxial seal waterproof tape, three four inch pieces of heat shrink tubing and 35 fasteners.
GPS Re-radiating Antenna Assembly	J700 - 2A4A3 consisting of the following: One re-radiating antenna with SMA connector, electronic enclosure with 2 green LED power indicators, TNC-female input signal connector, multi- position gimble mounting bracket, and mounting hardware
GPS Repeater Amplifier	J700 - 2A4A4 consisting of the following: Four digit LED gain display, On/Off Power switch, Up/Down gain control, color coded power supply connector, input and output TNC-female connectors, and mounting hardware.
GPS Repeater Amplifier Power Supply	J700 - 2A4A4A1
GPS Repeater Amplifier Surge Protector	J700 - 2A4A4A2
GPS Re-radiating Antenna Cable	J700 - 2A4W1 consisting of the following: 25 feet of RG-213/U low-loss coaxial cable terminated on one end with a TNC male connector and one end unterminated; and a package containing a TNC-male connector, and cable labels.
GPS Antenna/Repeater Amplifier Cable	J700 - 2A4W2 consisting of the following: 150 feet of RG-213/U low-loss coaxial cable terminated on one end with a TNC male connector and one end unterminated; 2 packages of N-type male connectors, cable labels, and 1 package containing a TNC male connector.

NOTE: It is absolutely necessary that all exposed coaxial connections be sealed with coax tape or waterproofing to minimize the effects of moisture intrusion and corrosion in and around the surfaces of the coaxial connectors. Failure to do so will compromise the GPS antenna power and signal connections and will increase the likelihood of reduced or lost signal reception at the input to the GPS Repeater Amplifier.

NOTE: If a decision is made to use this optional antenna mount, skip Section 2 and use Section 3. A determination must be made as to where this bracket will be installed. Sites must purchase appropriate length 1/4-inch diameter lag screws or bolts and nuts to accommodate the particular building material thickness and optimal mounting location.

Tools and Supplies Required
Coaxial cable stripper or wire cutters
Soldering iron and solder
Two - 5/8-inch open-end wrenches
Adjustable wrench
Tape measure
Electric drill
50 foot extension cord
Heat gun
1/8-inch drill bit
1/4-inch drill bit
Eight drywall anchors and screws sized appropriately for the anchors (used to mount the Repeater Amplifier and Re-radiating Antenna mount)
Six 3-inch by 1/4- inch lag screws (for mounting the Reconfigurable Antenna Mounting Bracket)
Pencil or fine-tip marker
Flat head and Phillips screwdrivers
Optional: 6 or 8 foot ground rod for attaching lightning arrestor grounding cable clamp
Power supply fed radiosonde (used for calibrating the Repeater Gain setting for the site)

2. INSTALLATION OF THE TRIPOD ANTENNA MOUNT (J700-2A4MP1)

Decide where the GPS antenna cable will enter the building from the exterior. On flat roof surfaces, locate a conduit entry cableway or similar weatherproof roof penetration location that will accommodate the GPS Antenna Cable. This location is where the Tripod Antenna Mount will be fastened to the roof of the facility. In addition, the antenna cable entry point shall be determined to route the GPS Antenna Cable that allows for convenient placement of the GPS Repeater Amplifier within the facility. The GPS Repeater Amplifier must be installed within the

facility in an area where the radiosondes are prepared for launch, specifically for baseline acquisition of GPS signal.

CAUTION

Electrocution Hazard Exists. Check with local electrical codes and observe all applicable NWS Safety precautions for routing any cables within close proximity of incoming power feeder lines, rooftop air handler power lines, exterior lighting fixtures, obstruction lighting cable entry points, or high power transmit antenna cables and their accessories.

<p>NOTE: The 150 foot coaxial cable length is the <u>maximum</u> allowable distance from the GPS Receive antenna to the GPS Repeater amplifier. The entire length is NOT required for GPS Repeater installation, and may be cut to length to accommodate the installation as required. This cable serves to provide DC power to the active GPS Receive antenna and to provide an RF path for the received GPS signal to the input connector of the GPS Repeater Amplifier. Do not exceed the length of the 150 foot coaxial cable as a failure to adequately power the outdoor mounted GPS Antenna will result. Likewise, an increase in cable length will reduce the GPS Repeater Amplifier's input signal level, resulting in the inability of the GPS Repeater Amplifier to re-transmit the GPS signal into the radiosonde baseline preparation area.</p>

1. Determine the location for the GPS Antenna Tripod mount.
2. Unfold each of the three legs of the Tripod, locking them outward into position using the hinged supports along the inside of the legs. The mounting plate at each end of the tripod legs can be swivelled for placement parallel to the mounting surface. See Figure 1.
3. Position the tripod at a level location on the roof as close as possible to a suitable cable entry point into the building, keeping in mind the required unobstructed view requirement for the GPS Receive Antenna. Mark the location of the mounting holes at the bottom of the tripod and bore a starter hole into roof material approximately to a depth of ½ inch.
4. Using the lag screws, secure the tripod legs onto the roof surface, keeping the lag screws perpendicular to the surface of the roof.
5. After all tripod legs are secure, apply the roof patch material over the lag screws at the places where they penetrate the mounting holes and roof penetration.



Figure 1 Tripod mount of GPS Antenna and conduit with cable

This completes the installation of the tripod mount and the GPS Receive Antenna

3. INSTALLATION OF THE RECONFIGURABLE ANTENNA MOUNTING BRACKET (J700-2A4MP2)

Before beginning the installation of the reconfigurable antenna mounting bracket, a decision must be made as to where and how this antenna mounting bracket will be installed on the facility. This bracket can be configured in any number of ways to securely fasten a four foot section of the one-inch conduit supplied with the tripod mount with the GPS Receive Antenna securely fastened. Refer to Figure 2.



Figure 2 Installed reconfigurable antenna mounting bracket for under eave or roof edge installations

NOTE: The optimal location for antenna mounting using the reconfigurable mount must ensure the GPS Receive antenna has an unobstructed view of the sky and allow the coaxial cable for the GPS Receive antenna cable to reach the desired location within the facility that will allow the GPS Repeater Amplifier to function properly.

1. Assemble the reconfigurable mounting bracket to accommodate the desired mounting scheme for your site's GPS Receive Antenna. The bracket includes a Ziploc bag of hex bolts, U-bolts, backing plates, and locking nuts.
2. The reconfigurable mounting bracket itself is comprised of three parts consisting of a single mounting arm and two mounting plates. Determine which configuration is best suited for the type of mounting required at the facility.
3. Attach the two U-bolts, end plates and Nyloc locking nuts to the mounting arm portion of the bracket. DO NOT tighten the U-bolts at this time. See Figure 3.

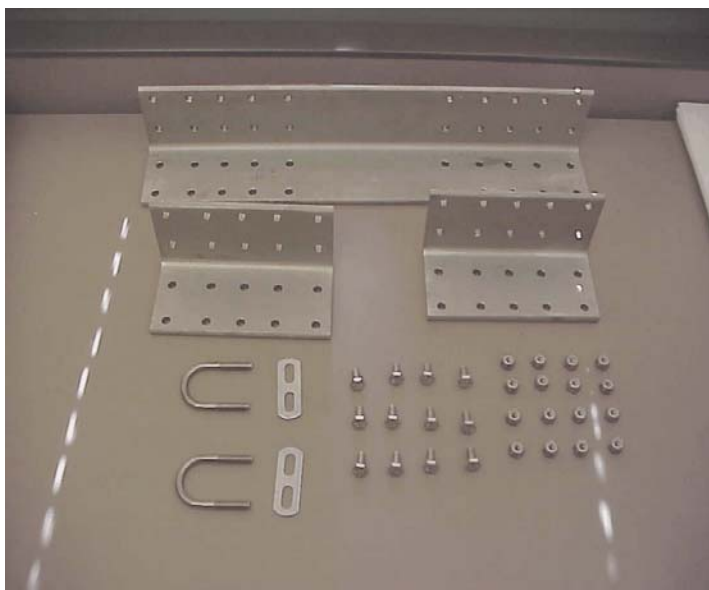


Figure 3 Unassembled view of Reconfigurable Antenna Mounting Bracket

4. The next steps will require overhead or rooftop installation of the reconfigurable mounting bracket to the building.

CAUTION

The installation will require mounting the bracket overhead. Refer to National Weather Service Safety Manual Number 1115 for personnel safety regulations and guidelines for working overhead.

5. Using locally acquired lag screws, mount the mounting bracket to the appropriate side of the roof edge, under roof edge eave, building end wall or other suitable surface for allowing the bracket to secure the antenna mast and GPS Receive Antenna for an unobstructed view of the sky.
6. If only the mounting bracket is to be mounted at the roof edge, use lag screws to fasten the mounting plate to the roof's edge at the gable end, see Figure 3.

This completes the assembly and installation of the reconfigurable antenna mounting bracket.

4. INSTALLATION OF THE GPS RECEIVE ANTENNA (J700-2A4A1) TO THE ANTENNA CONDUIT (MAST)

The Tripod Antenna Mount will require both sections of four foot conduit, for a total length of eight feet. The Reconfigurable Antenna Mounting Bracket will require one four-foot section of conduit. There may be instances where the entire eight foot assembly of conduit (mast) is used when using the Reconfigurable Antenna Mounting Bracket, to position the GPS Receive Antenna for an unobstructed view of the sky.

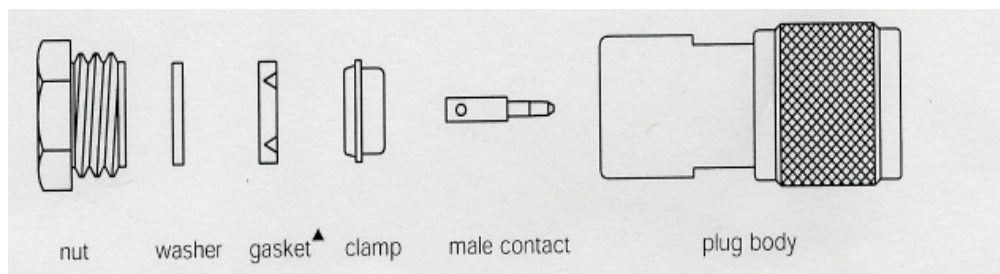
NOTE: When orienting the antenna conduit (mast), always be sure the threaded conduit coupler is positioned at the top for attaching the GPS Receive Antenna.

1. For the Tripod Antenna Mount, use two four-foot sections of conduit and secure the ends together using the conduit coupler. Tighten the coupler fastening nuts. For the Reconfigurable Antenna Mounting Bracket, use a single section of conduit. NOTE: A threaded conduit coupler is pre-attached to one end of one of the conduits. This end is always located at the top of the antenna mast. Set this assembly aside.
2. Take the 150 foot of coaxial cable, noting the terminated end with the TNC-male connector, and measure from the bottom of the connector approximately two feet longer than the total conduit (mast) length. For the eight foot mast, ten feet of cable, and for the four foot mast, six feet of cable. Cut the appropriate length from the entire 150 foot section. Set remaining coaxial cable aside.
3. Run the unterminated end of the coaxial cable through the threaded conduit end.
4. Securely fasten the GPS Receive Antenna's female TNC connector to the TNC-male end, making sure not to cross-thread the connections.

CAUTION

Do not over tighten the coaxial cable to the GPS Antenna or damage could result to the base of the GPS Antenna. Hand tighten until firmly seated against the bottom of the GPS Antenna's base.

5. Position the GPS Receive Antenna and threaded coupler onto the top-most end of the conduit and tighten the coupler's setscrew using a blade screwdriver.
6. After attaching the GPS Receive Antenna to the conduit (mast), there should be approximately two feet of coaxial cable exiting the end of the conduit. Prepare this unterminated end of the coaxial cable for the N-type male connector using Figure 4, and install the connector.



Cable end stripping dimensions for Step 1 above:

For TNC male connectors: $a = 5/16$ inch and $c = 1/8$ inch

For N-type male Connectors: $a = 5/16$ inch and $c = 3/16$ inch

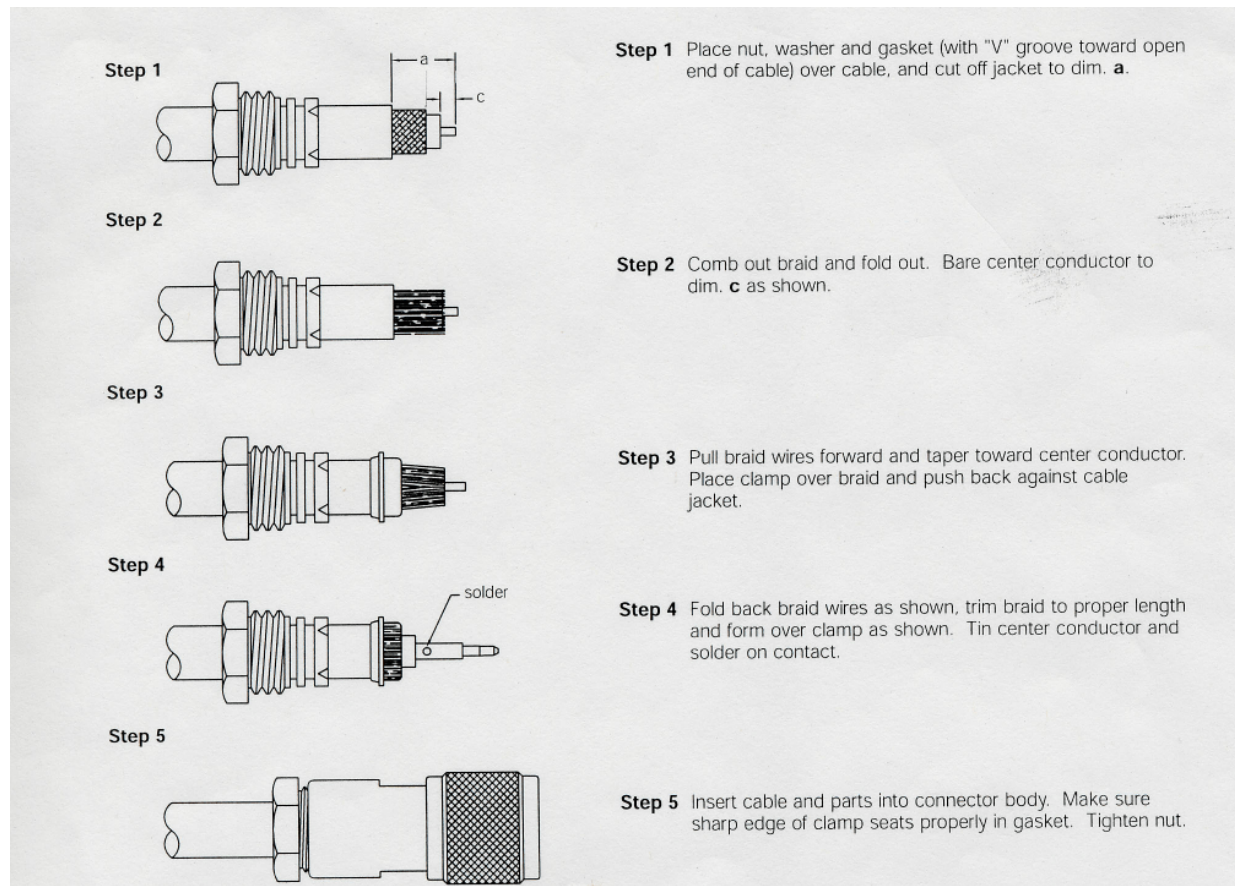


Figure 4 Connector installation instructions for N-type male and TNC-male connectors

7. The completed assembly will either be mounted with the Tripod Mount or to the Reconfigurable Mounting Bracket.
8. This terminated coaxial cable exiting the open end of the conduit (mast) will connect to the lightning arrestor in Section 5 below.

This completes the GPS Receive Antenna installation to the conduit (mast).

5. ATTACHING THE ANTENNA MAST TO THE TRIPOD OR RECONFIGURABLE ANTENNA MOUNTING BRACKET

This section describes the procedure for attaching the antenna mast with the GPS Antenna to either the tripod mount or the reconfigurable antenna mount.

5.1 Tripod Mount. Perform steps 1 through 4 if a tripod installation is to be used.

1. When attaching the antenna mast to the tripod, make certain the legs are fully extended and locked into position.
2. Loosen the three hex nuts and bolts on the center collar of the tripod to accommodate the 1-inch conduit (mast).
3. Place the N-type connector end down through the top of the tripod, leaving about one foot of the conduit from the bottom. This will allow the coaxial cable to freely extend from the end of the conduit and not bend too sharply.
4. With the conduit in place, tighten the three hex bolts at the center of the tripod. It may be necessary to remove the hex nuts that are threaded onto the hex bolts. This will allow the hex bolts to extend further into the collar providing for a more secure fit of the conduit.

5.2 Reconfigurable Antenna Mounting Bracket. Perform steps 5 through 8 when using the Reconfigurable Antenna Mounting Bracket.

5. In Section 3, step number 3, the reconfigurable mounting bracket's U-bolts, backing plate, nuts and Nyloc nuts were not tightened. This was to allow for attaching the GPS Antenna and conduit (mast) to the bracket at the end.
6. Carefully route the N-type connector of the coaxial cable the bottom end of the conduit through the two U-Bolts.
7. Position the conduit such that about six inches extends below the mounting arm of the reconfigurable antenna mounting bracket. Refer to Figure 2.
8. Tighten the Nyloc bolts on each of the U-Bolts. This secures the antenna mast to the bracket.

6. INSTALLING THE GPS ANTENNA LIGHTNING ARRESTOR (J700-2A4A2) AND GPS ANTENNA GROUNDING KIT (J700-2A4A2A1)

This section outlines the procedure for connecting the GPS Receive Antenna to the Lightning Arrestor and its connection to earth ground for protecting the GPS Receive Antenna (see Figure 5).

NOTE: A suitable connection to earth ground is required for the GPS Repeater Antenna. A ground rod is recommended for this ground. If connecting to a ground other than a ground rod, a suitable ground may be obtained using an external water pipe or similar grounded structure external to your facility.



Figure 5 GPS Antenna Lightning Arrestor with ground wire attached

1. Locate the Lightning Arrestor, its mounting hardware, the 100 feet of 6 gauge copper ground wire, the 35 clamps, and ground connector clamp.
2. The Lightning Arrestor should be mounted in close proximity to the GPS Receive Antenna. For tripod mounted installations, the Lightning Arrestor can be positioned near the bottom of the tripod legs. For installations using the reconfigurable antenna mounting bracket, the Lightning Arrestor can be mounted near the end bracket of the mount or along side the mounting arm using ultraviolet resistant tie wraps.
3. With respect to the GPS Receive Antenna's location, decide where the ground cable will be routed to attach to earth ground. See NOTE above.
4. Orient the Lightning Arrestor so that the N-type female connector end labeled with a RED "PROTECTED" end label is facing away from the GPS Antenna. This end will connect to the cable entering the facility.
5. At this point in the installation, a suitable entry point has been chosen to accommodate the coaxial cable's entrance into the facility and finally reaching the area where the radiosonde baseline preparations will take place.

6. Attach the N-type male connector on coaxial cable exiting the end of the conduit to the end opposite the end labeled "PROTECTED". Do not over-tighten this connection.
7. Using the supplied 3M™ Type 33 Electrical Tape, wrap the entire surface of the connector such that the adhesive side of the tape faces up while allowing for some overlap onto the coaxial cables. This will allow the coax weather seal tape used in the next step to be easily removed if it is necessary to access the connector.
8. Wrap the electrical tape with a layer of coax weather seal tape. This layering of tapes will provide easy removal of the coaxial seal tape from the connectors should it become necessary to replace the Lightning Arrestor.
9. Unreel the 100 feet of 06 gauge copper ground wire that is attached to the Lightning Arrestor and route this ground wire to the ground point. Use the supplied anchors to secure the ground wire to the facility. If these anchors do not suit, purchase anchors locally that will accommodate the building material used for the facility.
10. Cut the 06 gauge copper ground wire to the length desired. Fasten the supplied ground clamp to a ground rod or similar ground and connect the ground wire at this point. Securely fasten this clamp to the ground rod or similar ground.

7. ROUTING THE GPS ANTENNA/REPEATER AMPLIFIER CABLE (J700-2A4W2)

This section details the routing of the GPS Antenna/Repeater Amplifier Cable (the remaining length of 150-foot coaxial cable with one end terminated). This cable connects the GPS Receive Antenna to the GPS Repeater Amplifier. It is assumed the GPS Repeater Amplifier location has been chosen so that the GPS signal is re-radiated within the facility for baseline radiosonde preparations.

NOTE: It is easier to attach the N-type connector to the remaining length of the 150-foot cable indoors because soldering is required to assemble the connector onto the cable. A heat gun will also be used to apply the shrink tubing over the connector body and the coaxial cable. All three 4-inch pieces of heat shrink tubing will be used for assembling the GPS Repeater/Amplifier Cable (J700-2A4W2).

CAUTION

The heat gun can cause serious burns to exposed skin surfaces.

1. Slide a piece of shrink tubing over the unterminated end of the coaxial cable
2. Prepare one end of the remaining section of the 150 foot length of RG-213 and attach a N-type male connector on this end using the stripping instructions in Figure 4.
3. After the connector is installed, center the heat shrink tubing over the connector body and the coaxial cable. Carefully apply heat to the shrink tubing until the tubing shrinks around the cable and connector.
4. Take the cable outdoors.
5. Connect the male N-type connector to the Lightning Arrestor's female N-type connector end marked PROTECTED end. Carefully tighten this connector.

6. Wrap this connector end with 3M™ Type 333 Electrical Tape to all exposed areas of the connector such that the adhesive side faces up. Overlap the tape to completely cover the connector.
7. Over wrap the electrical tape with the coaxial waterproof tape, overlapping the electrical tape to completely cover all areas exposing the electrical tape. This step allows easy removal of the coaxial seal waterproof tape should the lightning arrestor need replacing.
8. Feed the unterminated end of this remaining length of RG-213 coaxial cable into the facility and carefully route this cable end within the facility where radiosonde baseline preparations will take place.

NOTE: Carefully pull the cable into the facility taking care not to put excessive strain on the cable end attached to the protected end of the antenna lightning arrestor.

9. Once fed into the facility, determine the length needed to reach the GPS Repeater/Amplifier and cut this cable to the desired length. Make note the length of this section of cable. Measured from the PROTECTED end connector of the Lightning Arrestor to the cut just made.
10. Prepare the unterminated end of the cable to install a TNC Male connector using the stripping and assembly instructions in Figure 4. Apply the heat shrink tubing according to Step 6 above.

This completes the GPS Receive Antenna Installation.

8. MOUNTING THE GPS REPEATER/AMPLIFIER (J700-2A4A4) AND THE GPS RE-RADIATING ANTENNA ASSEMBLY (J700-2A4A3)

This section details the steps necessary to install the GPS Repeater Amplifier and the GPS Re-radiating Antenna within the facility, refer to figures 6 and 7 that show the respective assemblies.

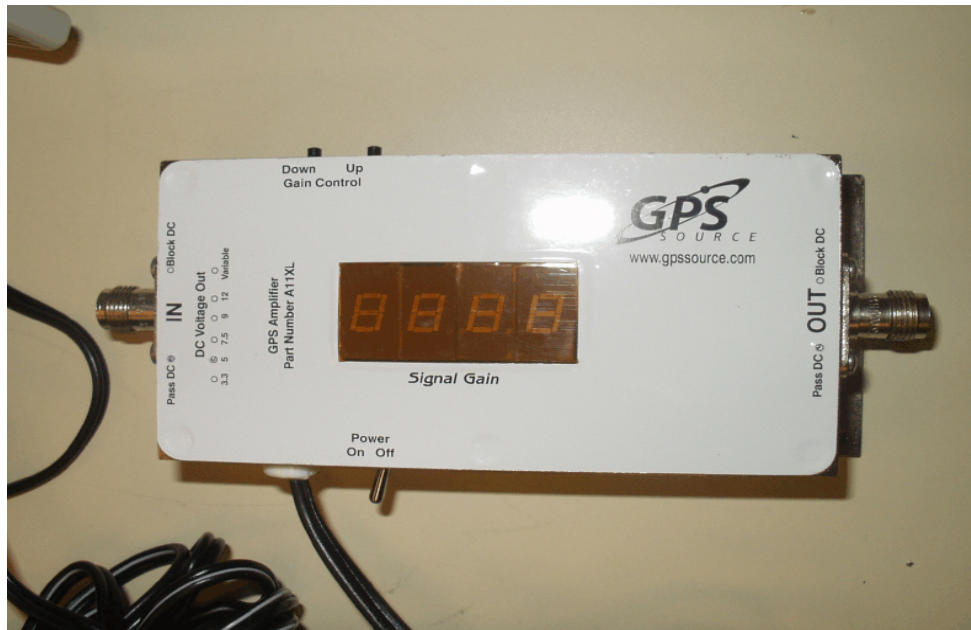


Figure 6 GPS Repeater Amplifier



Figure 7 GPS Re-radiating Antenna with gimble mount

1. Decide how the GPS Repeater Amplifier will reside within the facility.
2. Preferably, mount the GPS Repeater Amplifier on a wall or other structure that permits access to all controls and does not visually impair the ability to read the four digit LED gain display.

NOTE: The GPS Repeater Amplifier must be mounted within nine feet of an AC source.

3. Using a marker, outline the four mounting holes on the baseplate of the GPS Repeater Amplifier, see Figure 6.
4. Drill the four holes using a 1/8-inch drill bit and insert the four drywall anchors into the holes.
5. Mount the GPS Repeater Amplifier using the screws provided.
6. The GPS Re-radiating Antenna Assembly must be mounted within the same proximity as the GPS Repeater Amplifier, see Figure 7. The distance between these two sub-assemblies must not exceed 25 feet, or the entire length of the GPS Re-radiating Antenna Cable (J700-2A4W1).
7. Mount the GPS Re-radiating Antenna Assembly overhead on a wall facing into the area where radiosonde baseline activities are to take place. Position the unit that permits access to the GPS Repeater Amplifier by all personnel involved with baseline preparations of radiosondes.
8. Place the mounting plate against the wall and, using a marker, mark the four mounting holes for drilling.
9. Drill the four holes using a 1/8-inch drill bit and insert the four drywall anchors into the holes.
10. Mount the GPS Re-radiating Antenna Assembly using the screws provided.
11. Carefully position the GPS Re-radiating Antenna downward by loosening the gimble adjustment knobs on the GPS Re-radiating Mounting Bracket. This will allow for connection of the cable to the rear of the unit.
12. Using the 25-foot GPS Re-radiating antenna cable (one end terminated with a TNC-male connector), cut the appropriate length of this cable from the unterminated end. This cable will interconnect the GPS Re-radiating antenna and GPS Repeater Amplifier. Note the length of this cable.
13. Prepare the unterminated end of this cable for a TNC-male connector using the procedure outlined in Figure 4.
14. Attach one of the TNC male connectors to the GPS Repeater/Amplifier's female TNC connector labeled INPUT. Carefully tighten this connection, but do not over tighten.

15. Attach the other TNC-male connector to the GPS Re-radiating Antenna female connector at the rear of the assembly. Carefully tighten this connection, but do not over tighten.
16. The interconnecting cable can be fastened to the wall using adhesive-backed cable ties or cable clamps.
17. Locate the GPS Repeater Amplifier Surge Protector (J700-2A4A4A2) and plug it into an AC outlet in close proximity of the GPS Repeater Amplifier. See Figure 8 below.



Figure 8 GPS Repeater Amplifier Surge Protector

NOTE: DO NOT plug the AC-DC Power Supply into an AC outlet that allows the output power cable to run across floors, hallways, walkways, or across any personnel work space that would create a tripping hazard or entanglement situation. Refer to NWS Safety Manual, Number 1115.

18. Locate the GPS Repeater Amplifier Power Supply (J700-2A4A4A1) and plug it into one of the two AC outlets on the GPS Repeater Amplifier Surge Protector. See Figure 9.



Figure 9 GPS Repeater Amplifier Power Supply

19. Make sure ON/OFF switch located at the bottom of the GPS Repeater Amplifier is in the OFF position.
20. Interconnect the RED and BLACK power leads of the GPS Repeater Amplifier and the GPS Repeater Amplifier Power Supply respectively. Secure this connection with a small piece of electrical tape. Excess power lead can be neatly bundled and fastened to the wall in addition to the coaxial cable.
21. Make note of the entire lengths of RG-213 used for the installation of the GPS Repeater System. There are three lengths of cables:
 - a. The first length runs from the GPS Receive Antenna to the Lightning Arrestor (outside the building).
 - b. The second length runs from the PROTECTED connector of the Lightning Arrestor to the INPUT connector of the GPS Repeater Amplifier (Affix the provided label: GPS Antenna/Repeater Amplifier Cable, J700-2A4W2).
 - c. The third length runs from the OUTPUT connector of the GPS Repeater Amplifier to the INPUT connector of the GPS Re-radiating Antenna Assembly (Affix the provided label: GPS Re-radiating Antenna Cable, J700-2A4W1).

This total length will be used to assist in determining the gain setting of the GPS Repeater Amplifier for this site.

22. A typical wall mounted configuration of the GPS Repeater Amplifier, the GPS Re-radiating Antenna, and interconnecting cables is shown in Figure 10 below.

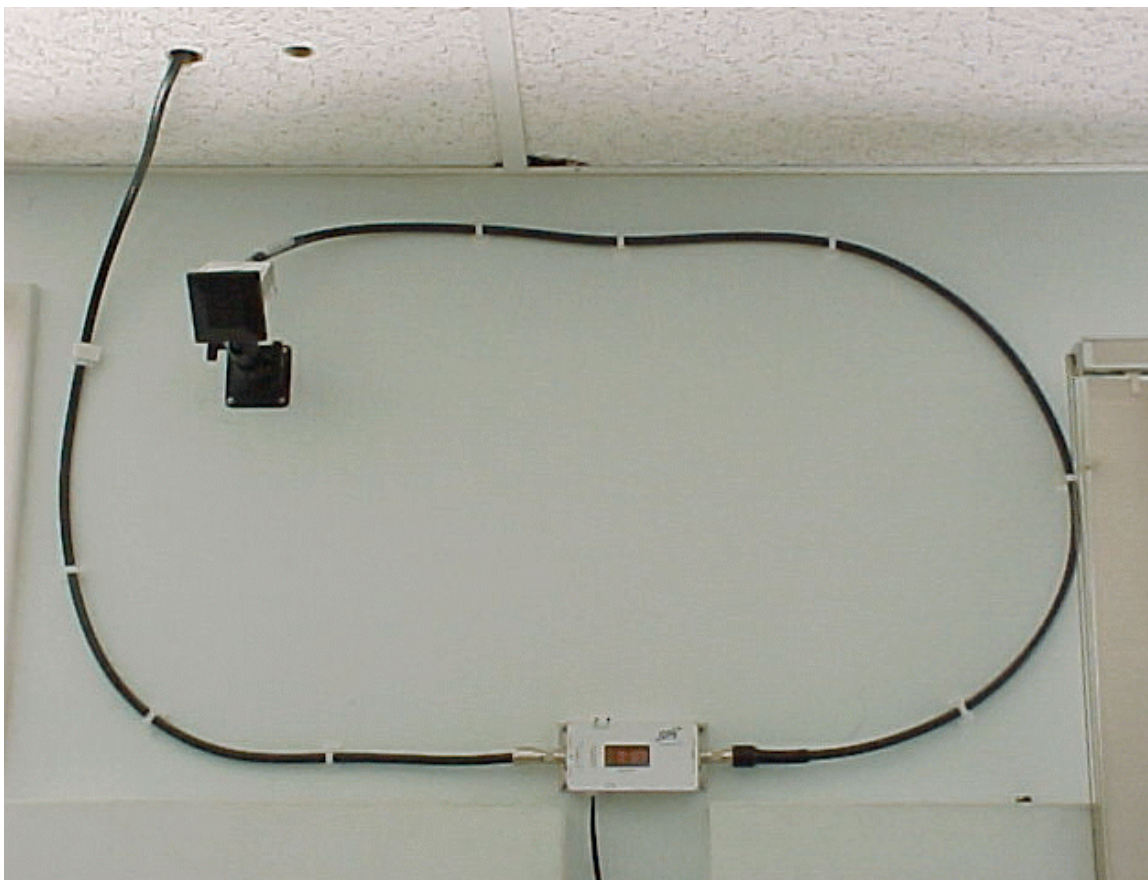


Figure 10 Typical installation of the GPS Repeater Amplifier and GPS Re-radiating Antenna w/interconnecting cable J700-2A4W2.

This completes the installation of the GPS Repeater System

9. CALIBRATION OF THE GPS REPEATER AMPLIFIER

This section outlines the procedure for determining the gain setting of the GPS Repeater Amplifier for the site.

NOTE: Read all steps in this section before proceeding.

1. Before beginning this calibration procedure, become familiar with the controls and indicators associated with the GPS Repeater Amplifier and the GPS Re-radiating Antenna Assembly. See Figures 6 and 7 for close up views of the two sub-assemblies.
2. Verify that all coaxial cable connections and power supply connectors are secure and the GPS Receive Antenna's Grounding kit is properly installed.

3. Turn on the Power ON/OFF switch on the GPS Repeater Amplifier, which is located at the bottom of the unit.
4. The four digit LED display will illuminate as well as two GREEN LED power indicators on either side of the GPS Re-radiating Antenna Assembly. This signifies that DC power is being fed to the GPS Receive Antenna and the RF amplifier/filter circuitry within the GPS Repeater Amplifier. The GPS Re-radiating Antenna is a passive antenna and does not require power for its operation.
5. With the GPS Repeater Amplifier turned on, the two pushbuttons on the top of the unit will increase or decrease the gain of the system. Note that the gain has a range spanning 60 dB, or - 40 dB to +20 dB in one dB increments.

NOTE: Each depression of the UP/DOWN gain control switches raises or lowers the gain by one dB. Holding down the switch DOES NOT adjust the gain in rapid succession.

6. Turn OFF the GPS Repeater Amplifier.
7. Using the two gimble adjustment knobs on the mounting bracket, adjust the GPS Re-radiating Antenna's position such that it tilts downward at approximately 45 degrees with respect to the antenna's SMA connector.

NOTE: This position of the re-radiating antenna will assist in determining the gain setting. The position of the re-radiating antenna may be adjusted to optimize the radiating antenna pattern and minimize any signal reflections that may result from near field obstructions that may interfere with the re-radiating signal into the radiosonde baseline preparation area.

8. Using the left side of Table 9-1, find the corresponding coaxial cable length used for this installation. Determine the distance and amplifier gain combination required to baseline the radiosonde using the corresponding values on the right side of the table.

Table 9-1. Radiosonde Range and Amplifier Gain

DETERMINE THE TOTAL CABLE LENGTH USED DURING INSTALLATION		PLACEMENT OF RADIOSONDE FROM RE-RADIATING ANTENNA (RANGE)				
		5 Feet	10 Feet	15 Feet	20 Feet	25 Feet
171 to 175 feet	SET REPEATER AMPLIFIER GAIN (dB) USING TABLE AT THE RIGHT	20	26	29	32	34
161 to 170 feet		19	25	28	31	33
151 to 160 feet		18	24	27	30	32
141 to 150 feet		17	23	26	29	31
131 to 140 feet		16	22	25	28	30
121 to 130 feet		15	21	24	27	29
111 to 120 feet		14	20	23	26	28
101 to 110 feet		13	19	22	25	27

DETERMINE THE TOTAL CABLE LENGTH USED DURING INSTALLATION		PLACEMENT OF RADIOSONDE FROM RE-RADIATING ANTENNA (RANGE)				
		5 Feet	10 Feet	15 Feet	20 Feet	25 Feet
91 to 100 feet	SET REPEATER AMPLIFIER GAIN (dB) USING TABLE AT THE RIGHT	12	18	21	24	26
81 to 90 feet		11	17	20	23	25
71 to 80 feet		10	16	19	22	24
61 to 70 feet		9	15	18	21	23
51 to 60 feet		8	14	17	20	22
41 to 50 feet		7	13	16	19	21
31 to 40 feet		6	12	15	18	20
21 to 30 feet		5	11	14	17	19
11 to 20 feet		4	10	13	16	18
1 to 10 feet **		3	9	12	15	17
** Impracticality of these lengths would assume GPS Receive Antenna is co-located within the same area as Re-radiating Antenna.						
How to use the table:						
<ul style="list-style-type: none">Determine the total cable length used during the installation. This length includes coaxial cable from the externally mounted GPS antenna to the lightning arrestor, plus the cable length from the lightning Arrestor to the input to the Repeater Amplifier, plus the length from the output of the Repeater Amplifier to the input of the Re-radiating Antenna. Another way to determine the total coaxial cable used is to measure the remaining cable lengths from each of the 25 foot and 150 foot lengths of coaxial cable and subtract the total of these from 175 feet.Using this total cable length, determine the distance from the Re-radiating Antenna to the desired location where the Radiosonde will be positioned during baseline preparations.Read down the column and set the Repeater Amplifier gain to the number corresponding to the distance.						

9. Determine the distance from the GPS Re-radiating Antenna to the location within the facility where the radiosonde will most likely be prepared for baseline procedures.
10. Knowing this approximate distance, read this distance at the top of the table and read down the column finding the gain setting that corresponds to the cable length used for this site. Note the gain setting.
11. Using the UP/DOWN gain switches on the GPS Repeater Amplifier, adjust the gain to the setting determined in Step 10.
12. At the RRS Workstation, power up the system and let it warm up for at least 15 minutes.
13. After warmup, initiate the hardware baseline system verification, and note the hardware status window.
14. Using a power supply fed radiosonde, place the radiosonde outdoors where the radiosonde can receive the GPS satellite constellation signal.

15. On the RRS Workstation hardware status screen, near the bottom of the window, there is an icon which notes Radiosonde Signal and GPS-Signal Processing System (SPS) Baseline Antenna Signal levels. A verification will be made within each of the small squares noting relative signal levels when the GPS signal is acquired by the GPS Radiosonde and the GPS-SPS Receiver. These numbers can range from 0 to 99. The higher the number the better.
16. As the GPS signal is received by the radiosonde placed outdoors, a relative signal level will be recorded in the small squares as well as the relative gain signal received by the GPS-SPS Baseline Antenna. A MATCH check mark will signify the reception of each pair of GPS signals.
17. After the radiosonde is powered up, the radiosonde has 200 seconds to acquire a minimum of four GPS receive signal MATCHES.
18. Record the relative GPS signal levels on the RADIOSONDE row of squares of the RRS Workstation Icon Hardware Status Window. Remove the DC power from the radiosonde.

NOTE: The GPS System will receive the GPS Constellation signals and re-radiate these signals indoors. The radiosonde will receive this re-radiated signal as if it were outdoors and will be detected by the TRS and presented to the hardware status display window.

19. Place the DC powered radiosonde in the desired location for baseline preparations.
20. Apply DC power to the radiosonde.
21. Orient the TRS receive antenna to receive the radiosonde baseline signal.
22. Observe on the TRS Hardware Status Window the Radiosonde received signal row of squares. Within 200 seconds of power application, note the corresponding gain settings and adjust the GPS Repeater Amplifier's gain setting that allows for the GPS receive signal level to match as close as possible to those values determined in Step 18 above.
23. The GPS Repeater System is calibrated.

This completes the Calibration of the GPS Repeater System

REPORTING INSTRUCTIONS:

Report the completed modification using the Engineering Management Reporting System (EMRS) according to the instructions in NWS Instruction 30-2104, Maintenance Documentation, Part 4, Appendix H. Include the following information on the EMRS Report:

- a. Block 7: **RRS**
- b. Block 8: **001**
- c. Block 17a: **01**

A sample EMRS report is provided as Attachment A.

Mark S. Paese

Director, Maintenance, Logistics, and Acquisition Division

Attachment A - EMRS Report Sample

Attachment A - EMRS Report Sample

A26 Detail Form - ESCM2, SILVER SPRING, MD :: JOHN MERHI - Microsoft Internet Explorer

GENERAL INFORMATION

NEW RECORD WFO* CAR Document No.* CAR40114000

1. Open Date 01/13/2004 Open Time 08:00 2. Op Initials WSH 3. Response Priority
☐ Immediate ☐ Low
☐ Routine ☒ Not Applicable 4. Close Date 01/13/2004 Close Time 16:00

5. Maintenance Description 469 characters left UPPER AIR
 Install RRS GPS Repeater system

EQUIPMENT INFORMATION

6. Station ID* CAR 7. Equipment Code RRS 8. Serial Number 001 9. TM M 10. AT M 11. How Mal 999

Alert: Time Remaining: 8:00
 (For Block 12 use only)

12. EQUIPMENT OPERATIONAL STATUS TIMES

a. Fully Operational		b. Logistic Delay		c. All Other		d. Logistic Delay		e. All Other	
Hours	Minutes	Hours	Minutes	Hours	Minutes	Hours	Minutes	Hours	Minutes

13. PARTS USAGE and CONFIGURATION MANAGEMENT REPORTING

ASN	Vendor Part No. (New Part)	Serial Number (Old Part)	Serial Number (New Part)	
				New Row
				Delete Row

14. WORKLOAD INFORMATION

a. Routine	b. Non-Routine	c. Travel	d. Misc	e. Overtime	
Hours	Minutes	Hours	Minutes	Hours	Minutes
			8		

MISCELLANEOUS INFORMATION

15. Maintenance Comments 695 characters left
 Installed RRS GPS Repeater System I.A.W. RRS Mod Note 1

16. Tech Initials TR

17. SPECIAL PURPOSE REPORTING INFORMATION

a. Mod No.	b. Mod Act/Deact Date	c. Block C	d. Trouble Ticket No.	e. Block E
1	01/13/2004			

Done Internet

Attachment B - RRS Sites**Region/Station****EASTERN REGION**

ALBANY, NY
BLACKSBURG, VA
BUFFALO, NY
CARIBOU, ME
CHARLESTON, SC
CHATHAM, MA
GRAY, ME
GREENSBORO, NC
PITTSBURGH, PA
MOREHEAD CITY, NC
STERLING, VA
UPTON, NY
WALLOPS IS., VA
WILMINGTON, OH

CENTRAL REGION

ABERDEEN, SD
BISMARCK, ND
CHANHASSEN, MN
DENVER, CO
DODGE CITY, KS
GAYLORD, MI
GRAND JUNCTION, CO
GREEN BAY, WI
INT'L FALLS, MN
LINCOLN, IL
NORTH PLATTE, NE
QUAD CITY, IA
RAPID CITY, SD
RIVERTON, WY
SPRINGFIELD, MO
TOPEKA, KS

VALLEY, NE
WHITE LAKE, MI

SOUTHERN REGION

ALBUQUERQUE, NM
AMARILLO, TX
BROWNSVILLE, TX
BIRMINGHAM, AL
CORPUS CHRISTI, TX
DEL RIO, TX
FORT WORTH, TX
JACKSON, MS
JACKSONVILLE, FL
KEY WEST, FL
LAKE CHARLES, LA
LITTLE ROCK, AR
MIAMI, FL
MIDLAND, TX
NASHVILLE, TN
NORMAN, OK
PEACHTREE, GA
SAN JUAN, PR
SANTA TERESA, NM
SHREVEPORT, LA
SLIDELL, LA
TALLAHASSEE, FL
TAMPA BAY, FL

WESTERN REGION

BOISE, ID
DESERT ROCK, NV
ELKO, NV
FLAGSTAFF, AZ
GLASGOW, MT
GREAT FALLS, MT
MEDFORD, OR
OAKLAND, CA

QUILLAYUTE, WA
RENO, NV
SALEM, OR
SALT LAKE CTY, UT
SAN DIEGO, CA
SPOKANE, WA
TUCSON, AZ

ALASKA REGION

ANCHORAGE
ANNETTE
BARROW
BETHEL
COLD BAY
FAIRBANKS
KING SALMON
KODIAK
KOTZEBUE
MCGRATH
NOME,
ST. PAUL ISLAND
YAKUTAT

PACIFIC REGION

GUAM
HILO, HI
KOROR, PALAU WCI
LIHUE, HI
MAJURO,
PAGO PAGO,
Pohnpei, ECI
CHUUK, ECI
YAP, WCI